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SOME OBSERVATIONS ON ORIUS (TRIPHLEPS) INSIDIOSUS (SAY)* **

BY

G. EDW. MARSHALL

The insidious flower bug which has been listed in the past as a beneficial insect may lose the respect of the entomologist as its habits and potentialities become better known. The literature shows that it is indigenous to North America and common over the entire United States. Since it does not fly readily, as do many of the other small Heteroptera, it is inconspicuous and seldom noticed.

A few observers who have become acquainted with the habits of this insect have been impressed mainly by its predatory demonstrations, which would immediately place it in the ranks of beneficial insects. Others have repeatedly watched this Anthocorid pierce plant tissues. To what extent plants are attacked is not yet known, but observations tend to show that this may be greater than has been realized.

Taxonomy

The insidious flower bug was described as **Reduvius insidiosus** by Say in 1831. Since that time the specific name has been little confused. In 1860, Fieber placed it in the genus **Triphleps** under which name it is generally known. Blatchley (5) places it in the genus **Orius** described by Wolff in 1811 and gives priority as his reason. According to Blatchley, **Orius tristicolor** (White) is a variety of **O. insidiosus** in which the clavus is almost entirely black. This form is usually found in the Pacific States, but it may be found in small numbers within the range of **O. insidiosus** throughout the United States.

Development and Habits

During the summer of 1928, the author's attention

*Contribution No. 376, from the Entomological Laboratory, Kansas State Agricultural College.

*Family Anthocoridae; Order Hemiptera.

was called to this small Anthocorid as the result of a study made to discover what insects oviposited above ground in the alfalfa plant. With a knowledge of the egg-laying habit, the possibility of injury by the oviposition immediately presented itself.

The eggs are shaped as a curved ellipse, light yellow in color, and have a metallic luster. They measure 0.188 mm. long. Garman and Jewett (2) found great numbers of eggs in corn silks. In alfalfa the eggs are generally inserted in the main stem at a node. Oviposition seldom occurs in the tough lower part of the stem, but often the tender growing distal portion is selected. Occasionally eggs are found in the leaf petioles. At the time of oviposition the female is positively thigmotropic and crawls as far as possible down between the stipule and the stem. The author has observed as many as 23 eggs laid within the space of one centimeter, at one node of the stem under field conditions. With so many eggs deposited, so close together at one node, the question is raised as to the effect of such oviposition on the subsequent growth of the plant distad of this point.

A secretion is poured over the egg, as the ovipositor is removed, which plainly marks the place where the egg has been laid. Upon drying this secretion becomes cap-like and after hatching, this structure stands out from the stem as with some other hemipterous eggs. At hatching, the egg-cap is pushed off and the nymph protrudes its head. The front feet are liberated next and the insect soon wiggles out, the long beak being loosed after the second pair of legs.

Garman and Jewett (2) working in Kentucky, found the average length of the egg stage to be nearly 9.5 days. Under Kansas conditions and during the same month, the egg stage was found to be less than five days.

Upon hatching, the young nymph immediately goes in search of food. Thrips often serve as the first meal although a newly hatched individual of the same species is eaten with equal relish. It is not long before any live food that can be captured is quickly drained of its vital juices. The nymphs are very active and seem to be hunting continually. Under insectary conditions, the instar measurements were found to be as follows:

Instars	Width Between Eyes	Length of Body	Days
1	.162 mm.	.549 mm.	3
2	.2 mm.	.7 mm.	2
3	.235 mm.	1.13 mm.	3
4	.3 mm.	1.37 mm.	7
5	.325 mm.	1.67 mm.	2
Egg to Adult 21 Days 17 Hours		Total	17

During the five instars, little change other than that of size is noted. At hatching, three bright orange spots occur on the dorsum of the abdomen which are retained till the fourth instar. During the fourth instar these fade somewhat and during the fifth they disappear as the insect becomes darker. At this time the size is the same as that of the adult (see table above). The light orange color, which characterizes the adult immediately after it emerges, soon darkens. The posterior end becomes dark first. After two hours the legs and nodum show much darker than the rest of the body and after three hours the insect attains its normal black appearance.

The male is somewhat shorter than the female and may be narrower. By the time the females are five days old, copulation has taken place and ordinarily oviposition has begun under insectary conditions. In one case, when two adults a few days old were put in the same vial, copulation took place in less than half a minute. One female laid 65 eggs in 11 days. Such a record is not considered exceptional and it is probable that under more favorable conditions this number would have been appreciably increased. The adult normally lives from 15 to 20 days. Accordingly the period in midsummer, from the time the egg is laid till the resulting adult dies, is from 35 to 45 days.

Orius insidiosus hibernates as an adult only. The winter period may be passed any place where the drainage is good and where a fairly good covering of leaves and rubbish can be found. The alfalfa field seems almost ideal in this respect, but even such coarse material as oak leaves is often sought.

Several types of injury must be ascribed to this pest. Blatchley quotes Uhler (1877, p. 427), as stating that this insect often feeds on the juices of certain small

fruits of the garden, giving them a nauseous taste. It might also be stated here that the nymphs were reared for two instars on the juice from alfalfa plants fed in absorbent cotton. Garman and Jewett (2) found that many eggs were laid in corn silks, but did not determine the effects of such oviposition on the growth of the pollen tubes.

Malloch (3) says that he experienced being bitten by the adults. In a paper by Hyslop (4), results of a preliminary experiment indicate rather strongly that stalk and ear rot of corn is spread by this insect. No conclusive work was done, however, to settle this question.

Predatory Habits

Few predators are known to feed on both plants and animals and it is also exceptional that an insect is found to feed on so many other insects. A review of the literature on the subject showed that **O. insidiosus** attacks the eggs, larvae, or adults of 53 insects and red spiders. This is probably but a small fraction of the actual numbers used by this insect as food.

Quaintance and Brues (1) found that 55 per cent of the eggs and many of the small larvae of the corn earworm were destroyed by **O. insidiosus.** When eggs are attacked, the beak is thrust through the shell and the contents soon extracted. The same thing happens when live insects are captured.

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NOTES ON KANSAS BOT FLIES (Oestridae; Diptera)*

BY

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(32)

*Contribution No. 377 from the Entomological Laboratory, Kansas Agricultural Experiment Station.

A chance observation sometimes leads to the working out of some of the more complicated insect life histories. The following notes are given with the hope that they may be followed up by someone when the opportunity presents itself:

The eggs of the rodent bot flies (Cuterebrinae) have been described by several observers (Hadwen, 1915; Townsend, 1915; Parker and Wells, 1919; Ferris, 1920), but in no case was the oviposition seen in nature. Townsend's (1915) observations on **Cuterebra cuniculi** Clk. showed on dissection that the incubating uterus contained "well over 5,000 eggs and perhaps nearer 10,000". He suggests that the egg is probably deposited in burrows or runways of the rodents. Hadwen (1915) has described the egg of **Cuterebra fontinella** Clk., and Parker and Wells (1919), in their study of **Cuterebra tenebrosa** Coq. were able to get experimental infestation of prairie dogs. The latter authors described and gave a photograph of the eggs which they found "glued" to the box in which a female had been kept. Concerning the method of attachment they say: "The ventral surface of the egg is broad on the posterior two-thirds, and the surface of the egg on this area is somewhat sunken inward. If this is a groove, it is certainly very wide and shallow if intended to be attached to a single hair. The eggs were found fastened by this surface."

On May 26, 1929, at the sand dunes at Medora, Kansas the writer observed a female of **Bogeria buccata** (Fab.) hovering among the weeds at the side of a dune and ovipositing on a small, dead twig. When she started to fly away, she was captured and brought in with the stick to which the eggs were attached. The stick carried four eggs very similar to those shown by Parker and Wells (1915, fig. 1, 2, and 3) fastened one above the other parallel to the stem. The question whether this is the normal method of oviposition is rendered difficult because the fly is abnormal. The second segment of the abdomen is incomplete in the center. However, this seems to be the only abnormality and as the eggs contain fully developed first stages larvae, it appears that this peculiar structure did not interfere with the reproductive functions. Taken together, the evidence seems to be that flies of this group of species lay their eggs promiscuously near their hosts, as do some of the other

parasitic flies. We have little evidence as to how the transference to the host is made. The eggs of **Cuterebra americana,** observed by Ferris (1920), hatched without outside stimulus; those observed by others required outside help in emergence. The eggs which I collected did not hatch, and when one was opened several months later, the dead larva was found inside. The experiments of Parker and Wells (1916) and recent observations of the presence of these bots on carniverous animals seem to indicate that infestation sometimes takes place by the swallowing of the larvae. This, however, may not be true of all species.

The species of rodent bot flies in the Kansas State Agricultural College collection are as follows:

1. **Cuterebra cuniculi** (Clark). One female, Franklin County, Kans., May 24, 1921, H. K. Gloyd, collector.
2. **Bogeria buccata** (Fab.). Three females, Riley County, Kans, July 26-Aug. 1. McColloch and Hayes, and F. Marlatt, collectors; one female, St. George, Kans., July 21; one female, Medora, Kans.; May 26, 1929, sand dunes, R H. Painter, collector; several males taken from student collections.
3. **Bogeria fasciata** (Swenk). Three females, Riley County, Kansas. June 14 to July 20, Geo. A. Dean, J. B. Norton, and S. A. Geauque, collectors.

In addition to these, **Cuterebra tenebrosa** Coq., and **Bogeria princeps Aust.** may be expected in the western part of the state, and **Cuterebra cyanella** Jones in the northern part.

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ANOTHER SEASON'S TRAP-LIGHTING OF LEAFHOPPERS

BY

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Purpose—During the summer of 1928 the writer collected all the leafhoppers caught at a trap light and recorded the results in a paper published in the Journal of the Kansas Entomological Society, Vol. II, pp. 39-47, 1929. The experiment was continued during the summer of 1929 to see how the results of the two seasons would check and also to get further information on the value of collecting at lights relative to such questions as the following: What are the most abundant species in the community? To what extent would new or rare species be taken? How often and under what conditions does swarming occur and what species are involved? Could the number of broods of a given species be thus determined? What species hibernate as adults or as nymphs as indicated by their early appearance at the light?

*Contribution from the Department of Entomology, University of Kansas.

Apparatus—Last year's apparatus was used. This consisted of a 200-watt Mazda bulb suspended under a suitable shelter about six inches above a funnel nearly two feet in diameter which tapers to a tube four inches in diameter and eighteen inches long. This tube is built in three sections and holds the cyanide enclosed in a perforated two-ounce box. This light was suspended eight feet from the ground on the south slope of a hill. It is fairly well surrounded by buildings on the north and east but open meadows extend to the south and west.

Comparison of Catches of 1928 and 1929—The total number of different species taken was somewhat greater in 1929. The commonest species of both seasons were almost the same as is shown by the table below where the twelve commonest species are listed in the order of their abundance for each season.

TABLE OF COMMONEST SPECIES

1928	1929
Draeculacephala mollipes	Euscelis obscurinervis
Euscelis obscurinervis	Draeculacephala mollipes
Deltocephalus inimicus	Deltocephalus inimicus
Phlepsius irroratus	Phlepsius irroratus
Deltocephalus nigrifrons	Empoasca fabae
Empoasca fabae	Deltocephalus nigrifrons
Cicadula sexnotata	Cicadula sexnotata
Eutettix seminudus	Agallia constricta
Deltocephalus flavicosta	Deltocephalus flavicosta
Eugnathodus abdominalis	Eutettix chenopodii
Agallia constricta	Gypona octolineata var. striata
Scaphoideus immistus	Eutettix seminudus

The season of 1929, however, seemed to be a much better leafhopper year than 1928 as is evidenced by the much larger number of specimens taken. In 1928 the number of catches of over a thousand specimens per species per night was only ten, while in 1929 the number of such catches was twenty-four. Moreover the total number of specimens of the first seven species taken in 1929 was very much larger than in 1928 when these same species were again the first seven as to numbers taken. With many other species also the number taken in 1929 was very much larger than in 1928. The following table gives some idea of the numbers taken in 1929:

TABLE OF SEASON'S CATCH

Euscelis obscurinervis	141,153
Draeculacephala mollipes	95,668
Deltocephalus inimicus	15,989
Phlepsius irroratus	13,399
Empoasca fabae	9,485
Deltocephalus nigrifrons	3,351
Cicadula sexnotata	1,697
Agallia constricta	1,228
Deltocephalus flavicosta	958
Eutettix chenopodii	596
Gypona octolineata var. striata	526
Eutettix seminudus	455
Eugnathodus abdominalis	417
Xestocephalus pulicarius	341
Chlorotettix tunicatus	326
Scaphoideus immistus	308
Dikraneura fieberi	277
Deltocephalus sonorus	200
119 other species and varieties	2,261
Total	288,635

In 1928 the first four species listed above constituted about 85% of the total catch of the season. In 1929 these species made up 90% of the total number of specimens taken. In both seasons the above four species along with **Deltocephalus nigrifrons, Empoasca fabae** and **Cicadula sexnatata** were by all odds the seven commonest species. Since these same species are also the ones most commonly taken in the field, it is safe to believe that they are the most abundant species in this region.

Typical records of a month's catch of the two commonest species may be interesting and will show how irregularly leafhoppers appear at lights.

DRAECULACEPHALA MOLLIPES

Aug. 1	35	Aug. 11	20,154
Aug. 2	299	Aug. 12	614
Aug. 3	603	Aug. 13	83
Aug. 4	11	Aug. 14	4
Aug. 5	0	Aug. 15	4
Aug. 6	2,017	Aug. 16	7
Aug. 7	259	Aug. 17	42
Aug. 8	22,891	Aug. 18	30
Aug. 9	1,559	Aug. 19	1
Aug. 10	8,409	Aug. 20	9

Aug. 21	25	Aug. 27	729
Aug. 22	66	Aug. 28	54
Aug. 23	8	Aug. 29	24
Aug. 24	20	Aug. 30	29
Aug. 25	882	Aug. 31	93
Aug. 26	752		

EUSCELIS OBSCURINERVIS

Sept. 1	78	Sept. 16	26
Sept. 2	365	Sept. 17	16
Sept. 3	62	Sept. 18	0
Sept. 4	26	Sept. 19	0
Sept. 5	70,225	Sept. 20	20
Sept. 6	6,500	Sept. 21	32
Sept. 7	11,015	Sept. 22	7
Sept. 8	10,529	Sept. 23	3
Sept. 1	526	Sept. 24	5
Sept. 10	27	Sept. 25	25
Sept. 11	0	Sept. 26	26
Sept. 12	12	Sept. 27	0
Sept. 13	86	Sept. 28	11,075
Sept. 14	4	Sept. 29	800
Sept. 15	758	Sept. 30	750

LIST OF SPECIES

The following is a list of the species taken during the season:

Agalia constricta
Agallia novella
Agallia uhleri
Idiocerus alternatus
Idiocerus duzeei
Idiocerus pallidus
Idiocerus snowi
Idiocerus verticis
Macropsis gleditschiae
Oncopsis distinctus
Bythoscopus apicalis
Kolla bifida
Graphocephala coccinea
Draeculacephala mollipes
Gypona octolineata
Gypona octolineata var. cana
Gypona octolineata var. striata
Gypona scarlatina var. puncticollis
Xerophloea viridis
Xestocephalus pulicarius
Xestocephalus superbus
Spangbergiella vulnerata
Parabolocratus flavidus
Mesamia nigridorsum
Scaphoideus auronitens
Scaphoideus cinerosus
Scaphoideus immistus
Scaphoideus luteolus
Scaphoideus scalaris
Platymetopius acutus
Platymetopius cinereus
Platymetopius frontalis
Deltocephalus caperatus
Deltocephalus flavicosta
Deltocephalus fumidus

Deltocephalus inimicus
Deltocephalus interruptus
Deltocephalus lawsoni
Deltocephalus nigrifrons
Deltocephalus obtectus
Deltocephalus osborni
Deltocephalus parvulus
Deltocephalus sonorus
Deltocephalus visendus
Deltocephalus weedi
Deltocephalus sp. n.
Euscelis obscurinervis
Euscelis parallelus
Euscelis striolus
Eutettix chenopodii
Eutettix cinctus
Eutettix seminudus
Eutettix snowi
Opsius stactogalus
Phlepsius altus
Phlepsius cinereus
Phlepsius irroratus
Phlepsius lobatus
Phlepsius majestus
Phlepsius nebulosus
Phlepsius solidaginis
Phlepsius truncatus
Phlepsius turpiculus
Acinopterus acuminatus
Thamnotettix aureovittatus
Thamnotettix brittoni
Thamnotettix ciliatus
Thamnotettix clitellarius
Thamnotettix fitchii
Thamnotettix inornatus
Thamnotettix longulus
Thamnotettix perspicillatus
Chlorotettix balli
Chlorotettix galbanatus
Chlorotettix nudatus
Chlorotettix spatulatus
Chlorotettix truncatus
Chlorotettix viridius
Chlorotettix vividus
Jassus olitorius
Cicadula punctifrons
Cicadula sexnotata
Cicadula variata
Balclutha impicta
Eugnathodus abdominalis
Alebra albostriella var. agresta
Alebra albostriella var. fulveola
Dikraneura angustata
Dikraneura fieberi
Dikraneura sp. n.
Alconeura rotundata
Empoasca denticula
Empoasca fabae
Empoasca flavescens
Empoasca obtusa
Empoasca radiata
Empoasca unicolor
Typhlocyba gillettei
Typhlocyba gillettei var. casta
Typhlocyba gillettei var. saffrana
Typhlocyba modesta
Typhlocyba rosae
Hymetta trifasciata
Erythroneura aclys
Erythroneura amanda
Erythroneura basilaris
Erythroneura beameri
Erythroneura campora
Erythroneura elegans
Erythroneura kansana
Erythroneura lawsoni
Erythroneura maculata
Erythroneura niger
Erythroneura obliqua
Erythroneura rubra
Erythroneura tricincta
Erythroneura tricincta var. calycula
Erythroneura tricincta var. integra
Erythroneura vitifex

Erythroneura vitis
Erythroneura vitis var. corona
Erythroneura vitis var. stricta
Erythroneura vulnerata
Erythroneura ziczac
Erythroneura sp. n.

13 new species.

The members of the genus Erythroneura were determined by Doctor R. H. Beamer who will describe the new species.

Of the species taken in 1929 at least thirty were not taken at the light in 1928. It would seem, therefore, that a rather extensive collection of leafhoppers could be made simply by trap lighting.

Rare and New Species—In addition to thirteen new species of Erythroneura, the light trap gave us this season a number of specimens of a new Deltocephalus and a new Dikraneura. In addition the known range of a number of species is extended. **Eutettix snowi** is recorded for the first time outside of Arizona and **Empoasca radiata, Deltocephalus fumidus, Thamnotettix aureovittatus** and **Thamnotettix inornatus** are found for the first time in Kansas. A number of other species, represented in most collections by a very small number of specimens, were also taken, some of them in rather large numbers.

Data on Life Histories.—Again this year the records have been studied to see whether or not systematic collecting at a trap light throughout a season will give us any data regarding the life histories of leafhoppers. The light this year was started early in March and was kept going till late in October. The first leafhoppers were taken March 25th and the last on October 22nd. It should have attracted, therefore, the earliest species to emerge from hibernation, specimens from the several broods of all the species in the community during the season, and specimens from the last broods of these species.

It seems certain that the appearance of certain species early in the spring indicates that they hibernate as adults or nymphs either in whole or in part. The earliest species taken was **Thamnotettix longulus** on March 25. By May 1 the following other species appeared: **Dikraneura fieberi, Agallia novella, Euscelis obscurinervis, Cicadula sexnotata, Phlepsius irroratus, Empoasca fabae.** The only nights preceding the middle

of May which yielded specimens were March 25, April 17, 30, and May 1. Considering the coolness of the weather up to this time it seems certain that the specimens caught on these days, as listed above, hibernated either as adults or as nymphs.

The problem of the number of broods per season was again studied. Again it is realized that the overlapping of generations must make us cautious in drawing definite conclusions from the numbers appearing at trap lights, but the following results seem to be suggested by the catches of the past season:

Draeculacephala mollipes: Last year it was suggested that the catches of this species seemed to indicate four generations per season in our locality. This year the first specimens of the species were taken on May 23, the first brood reaching its maximum during the last of May and remaining abundant during the first third of June. There was then a decided decrease in numbers till after the first of July, followed by a decided increase indicating another brood about the middle of July. The numbers then were maintained till another peak was reached from August 8-12. This was followed by a decrease till about the second week in September when a fourth rise was shown. These data, therefore, again suggest the possibility of four broods for this species.

Euscelis obscurinervis: Last year's records indicated the possibility of three generations per year for this species. This year the first adults were taken April 30. It was not, however, till about June 10 that the first brood reached its maximum. There was then a definite rise in numbers from August 1-10 and a third rise during the first week in September. Seemingly there is agreement again between the records of the two seasons, indicating three broods per season.

Deltocephalus inimicus: Last year's data indicated three broods for this species in this locality. This year the first specimens of this species were taken May 31, the first brood evidently reaching its maximum during the second week of June. The last week in July saw a tremendous increase in the numbers of this species. The numbers then remained large till about August 10 and then decreased very markedly till September 5, when there followed a decided increase. Seemingly again three generations a year are indicated.

Phlepsius irroratus: Last year's records indicated

the possibility of three broods per year for this species. The first specimens this year were taken May 1. However it is clear that the first brood did not reach its maximum emergence till during the first and second weeks of June. During the rest of the season there were no definite rises or falls so that no information seems to be furnished concerning the remaining generations.

Meteorological Factors—It is perfectly clear that cold weather, severe rains and high winds keep leafhoppers close to the ground or in their diurnal habitat. It is not so easy, however, to state the conditions under which they swarm to lights in unusual numbers. Obviously the swarming species must be somewhere near its height as to its maximum emergence, but favorable weather conditions are absolutely necessary if it is to fly to lights in large numbers. The mating instinct may be here involved, but this would not explain the unusual swarms on certain single nights when on both the preceding night and on the following night the catches were at most but normal. In such cases the number of insects present in the community would seem to be the same for each of the three nights involved and there would seem to be no reason to believe that the mating urge would be stronger on one night than on the others.

A study of the weather records for five unusually favorable catches during the past season is given below.

WEATHER CONDITIONS

Date	Temp. 7 p. m.	Humidity 7 p. m.
May 30	65	100
May 31	69	100
June 1	75	82
June 26	74	62
June 27	79	75
June 28	79	44
Aug. 10	73	100
Aug. 11	83	88
Aug. 12	81	76
Sept. 7	68	76
Sept. 8	73	86
Sept. 9	60	68
Sept. 27	81	57
Sept. 28	78	71
Sept. 29	58	83

In each of the above five cases the middle one of the three dates produced the large catch and in each case it is evident that on this date there seemed to be a favorable combination of high temperature and high humidity. A high temperature seems to be the first requisite, but that alone without a high percentage of humidity does not seem favorable to leafhopper flights. Similarly high humidity with a fairly low temperature is not a favorable combination. These data would seem to indicate that when a night comes with a fairly high temperature and a relatively high humidity, especially when such a combination has not prevailed for several days, that on such a night we may expect a large number of leafhoppers at lights. The table below for several days preceding August 11, when a very large catch was made, would seem to bear out this statement.

Date	Temp. 7 p. m.	Humidity 7 p. m.
Aug. 6	71	86
Aug. 7	77	75
Aug. 8	78	75
Aug. 9	79	79
Aug. 10	73	100
Aug. 11	83	88
Aug. 12	81	76

Incidentally, August 11, 1928, was a night when a very large catch was made.

It is also of interest to note that from noon of August 11 to noon of August 12, there was a run of only 95 miles of wind as against an average run of 200-300 miles. At times of other large catches also the wind was always fairly low.

This season's observations would indicate, therefore, that if a large number of leafhoppers are present, they will swarm to lights when there is little wind, and when there is a favorable combination of high temperature and high humidity. This is true especially when such a night follows a period when satisfactory weather conditions have not prevailed.

FOUR NEW SPECIES OF THE DELTOCEPHALUS GROUP (HOMOPTERA CICADELLIDAE)

BY

*LEONARD D. TUTHILL, Lawrence, Kansas.**

Hebecephalus neomexicanus sp. n.

Figs. 1—1b

A medium-sized species, apparently related to **H. callidus.** Length of female 3 mm.

Form: Vertex as wide between eyes as length at middle, rather bluntly angled. Pronotum as long as vertex, slightly more than twice as wide as long, lateral margins short. Scutellum small, width less than that of vertex between eyes. Elytra short, exposing two-thirds of last abdominal segment; clavus not reticulate; central anteapical cell not divided.

Color: Cinereous marked with fuscous. Vertex light with two linear apical spots, a U-shaped spot each side of vertex with elongate arms and with a fuscous process extending toward the ocellus, median impressed line and ocelli black; eyes dark brown. Pronotum lightly washed with fuscous, with five light longitudinal lines, with three dark spots behind eyes, the outer one more linear. Scutellum pale, white margined. Elytra light, nervures white, fuscous margined. Anterior half of dorsum black, posterior half light. Frons yellowish white with traces of seven dark arcs. Venter cinereous marked with fuscous. Median half of last ventral segment and ovipositor black.

External genitalia: Last ventral segment of female as long as preceding, posterior margin shallowly concave and sinuated, with two slight lateral and one median incision; pygofer quite spiny, slightly exceeded by ovipositor.

Holotype, female, collected at Belen, New Mexico, August 19, 1927, by P .A. Readio. Type deposited in the Snow Entomological Collection, University of Kansas.

Laevicephalus poudris sp. n.

*Contribution from the Department of Entomology, University of Kansas.

Figs. 2—2c.

Resembling **L. parvulus** in size and general appearance but with genitalia distinct. A greenish-yellow species, vertex rather sharply angled. Length, female 3 mm.; male 2.75 mm.

Form: Vertex about as long as width between eyes, slightly longer than pronotum. Pronotum twice as wide as long, lateral margins very short. Elytra slightly longer than abdomen, central anteapical cell not constricted nor divided.

Color: Vertex yellowish with two apical dashes and median impressed line fuscous; ocelli black. Pronotum and scutellum yellowish green. Elytra of female yellowish hyaline with yellow nervures; of male transparent with slightly yellowish nervures. The black dorsum shows through the elytra in both sexes. Frons fuscous with seven light arcs; clypeus fuscous. Venter yellow, basal abdominal segments black in middle; ovipositor black.

External genitalia: Lateral margins of last ventral segment of female very short, segment then abruptly produced to about twice the length of preceding segment; middle half of posterior margin roundingly produced, slightly trilobate with central lobe much the largest; posterior margin, especially middle lobe, black; ovipositor exceeded by spiny pygofer. Male valve rounded with two large black spots on basal margin; plates as wide at base as last ventral segment, exceeding valve by twice its length, gradually narrowing to truncated tips which are one-half the width of base; pygofer exceeding plates by their total length, tips touching.

Holotype, a female from Poudre Canyon, Colorado, collected August 22, 1925 by R. H. Beamer and P. B. Lawson: **allotype,** a male from Ventra Valley, Wyoming, collected August 25. 1927 by George Cady; **paratypes,** two females from Ventra Valley, Wyoming, collected August 25, 1927 by George Cady.

Types deposited in the Snow Entomological Collection, University of Kansas.

Deltocephalus yavapai sp. n.

Figs. 3—3c.

A medium-sized, yellowish-brown species washed with red, somewhat resembling **D. punctatus** and **D.**

sonorus. Length, male 3 mm.; female 3.5 mm.

Form: Vertex about as wide as long. Pronotum as long as vertex, two and one-fourth times as wide as long, lateral margins short. Elytra slightly exceeding abdomen, broad and flaring, central anteapical cell divided. Elytra of female somewhat reticulated.

Color: Vertex yellowish with two more or less distinct red spots next to eyes, the rest of vertex more or less washed with red; eyes dark red. Pronotum splotched with red, especially anterior third. Scutellum with apical angle red. Nervures of elytra light largely margined with fuscous, especially apical and anteapical cells. Frons light fuscous with rather indistinct light arcs, upper part irregularly but distinctly marked with red. Venter light, washed with red, especially on pygofer in female.

External genitalia: Last ventral segment of female about twice as long as preceding, side margins short exposing underlying membrane, posterior margin trilobate, indentations and median lobe margined by two dark spots. Male valve triangular, apex roundingly obtuse; plates twice as long as valve, broad at base, margins slightly concave to slender tips, exceeded by spiny, acutely pointed pygofer.

Holotype, male, collected in Yavapai Co., Arizona, August 9, 1927 by R. H. Beamer.

Allotype, female, collected in Palopinto Co., Texas, July 14, 1928 by R. H. Beamer.

Paratypes, male collected in Yavapai Co., Arizona, August 9, 1927 by R. H. Beamer; male collected in Palopinto Co., Texas, July 14, 1928 by R. H. Beamer and a female collected the same date and locality by A. M. James.

Types deposited in Snow Entomological Collection, University of Kansas.

Polyamius kansiensis sp. n.

Figs. 4—4c.

A large robust species, brownish in color, seemingly related to **P. fumidus** but with distinctive genitalia. Length, male 4.5 mm.; female 5 mm.

Form: Vertex one-third wider than long, bluntly angled. Pronotum broad, twice as wide as long, lateral

margins short, posterior margin straight. Elytra long, greatly exceeding abdomen, clavus reticulate, central anteapical cell divided.

Color: Light brown marked with fuscous. Vertex light with two small, fuscous apical spots and two larger ovate black ones before eyes; eyes dark brown. Pronotum pale brown with five light longitudinal bands. Scutellum pale brown. Elytra light brown, nervures whitish, margined with fuscous. Dorsum fuscous. Face pale brown with more or less distinct light arcs; venter pale brown, ovipositor dark.

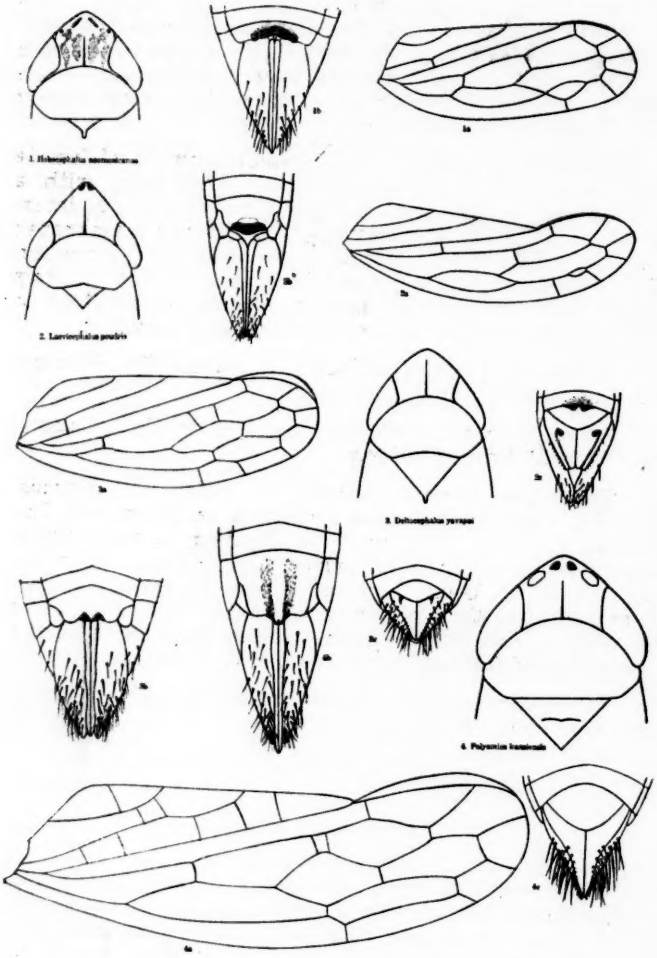
External genitalia: Last ventral segment of female two and one-half times as long as preceding, with a median keel ending in a protruded, notched tooth, lateral margins distinct but exposing underlying membrane; pygofer quite spiny, slightly exceeded by ovipositor. Male valve triangular, apex rounded; plates slightly longer than valve, broad basally, concavely narrowed to very acutely pointed tips, exceeding spiny pygofer.

Holotype, female, collected in Saline Co., Kansas, July 13, 1923 by R. H. Beamer.

Allotype, male, collected in Decatur Co., Kansas, July 6, 1925 by H. O. Deay.

Paratypes, female collected in Saline Co., Kansas, July 13, 1923 and a male collected in Ellsworth Co., Kansas, July 12, 1923 by R. H. Beamer; a male and a female collected in Washington Co., Kansas, July 11, 1925 by H. O. Deay; two males and six females taken in trap light at the University of Kansas from July 14 to 23, 1929; one male taken at the trap light at the University of Kansas on September 8, 1929.

Types deposited in the Snow Entomological Collection, University of Kansas.



TWO ERYTHRONEURA (GRAPE LEAF HOPPERS) DAMAGING APPLE IN KANSAS.

Homoptera, Cicadellidae)

BY R. H. BEAMER.

Department of Entomology, University of Kansas, Lawrence, Kansas.

While inspecting apple scion orchards near Ottawa, Kansas in September, 1929 the writer noticed the leaves were whitened by the work of some Cicadellid. Upon closer examination two species of grape leaf hoppers were found to be chiefly responsible for the injury. One of these was the well known **Erythroneura lawsoniana** Bak. (**E. dorsalis** Gill.) and the other was a new species belonging in the **campora** series. These two species were present in about the same numbers and were scattered evenly throughout the entire planting. Although the damage was not serious this season, all leaves were affected and a great many of them had considerably more than half the surface whitened by the loss of chlor ophyll. One could easily anticipate a much greater injury next season. An apple scion orchard at Lawrence, Kansas was found to be in about the same condition with the injury possibly not quite so great.

Erythroneura lawsoniana Bak.

This beautiful red-backed leafhopper was taken in abundance. Teneral specimens were almost black on the dorsum instead of the customary red. The large series of specimens taken also show a variation in the color of the spines of the hind tibia. They may be either light or almost black.

Erythroneura omani n. sp.

General ground color milky white. Vertex with a narrow median orange vitta. Pronotum with disc containing a somewhat triangular, orange spot, not reaching posterior margin. This spot may be almost rectangular with arms at anterior corners diverging to front margin of pronotum. Two orange blotches on lateral margin of pronotum just behind each eye. Scutellum with each basal angle and tip orange. Clavi with anchor shaped mark occupying most of basal half and another broad orange band just before tip. Coria with orange spot on costal margin one-fourth distance to costal plaque; a zigzag vitta with uneven margins arising just anterior to costal plaque, extending across to claval suture opposite light area of clavi, then angling

back toward costa to meet another bar arising posterior to costal plaque, the whole crossing to inner margin and extending to crossveins; a small black spot in posterior end of costal plaque and base of cell M4. Cross-veins more or less orange. Venter light.

Genitalia.

Pygofer hook single, very short and slender, curved evenly outward. Style with large foot; heel large; base curved; anterior point very short, slightly less than a right angle; posterior point almost as long as foot, narrow, sides almost parallel, forms less than a right angle with base of foot. Oedagus in lateral view of medium length, very thick shaft at base, slightly curved dorsally, very much narrowed apically, tip bent into a narrow lip dorsally, at right angles to shaft, venter of shaft with several very sharp spines or teeth, also a tooth on sides near base.

Holotype, male; Douglas Co. Kansas., September 10, 1929 R. H. Beamer.

Allotype and many paratypes Douglas Co., Kans., 1929 and Franklin Co., Kans., 1929; R. H. Beamer and P. W. Oman.

I take pleasure in naming this species after Mr. Oman who has been an untiring collector of Erythroneura and companion on many field trips.

ANNUAL MEETING

The Sixth Annual meeting of the Kansas Entomological Society was held in Fairchild Hall, Kansas State Agricultural College, Manhattan, Kansas, on March 22, 1930. There were 42 in attendance from Lawrence, Wichita and Manhattan.

New officers elected: President Geo. A. Dean, State Agricultural College; Vice President R. H. Beamer, State University; Secretary-Treasurer R. L. Parker, State Agricultural College.

IN MEMORIAM

James Walker McColloch, the editor of the Journal of the Kansas Entomological Society, was born at Anthony, Kansas, April 14, 1889. He died at Manhattan, Kansas, Nov. 11, 1929.

Mr. McColloch graduated from the Kansas State Agricultural College in 1912, with the degree of Bachelor of Science. While he was still an undergraduate in 1910, and 1911, he was a special field agent in entomology for the college. At that time his research began in regard to the chinch bug, corn earworm and Hessian fly. In the year of 1912 he was appointed assistant entomologist of the Kansas Agricultural Experiment Station, to investigate the chinch bug, Hessian fly and corn earworm. From 1915 to 1918 he was instructor of entomology in the college. During that time he published papers on these insects and their control, for which he received very favorable comment. The college, in 1918, promoted him to associate professor of entomology and associate entomologist of the Agricultural Experiment Station. His work in the interim expanded to those of insects inhabiting the soil, insect ecology and plant resistance to insect injury. This work

included the white grubs, false wireworms, Hessian fly, and wheat straw worm. He was considered one of the outstanding entomologists in economic entomology. In 1923 he received the degree of Master of Science from the Kansas State Agricultural College.

During the absence of the head of the Department of Entomology from 1923 to 1925, Professor McColloch was acting head of the department, acting entomologist of the Agricultural Experiment Station, and acting state entomologist of the Kansas Entomological Commission. In this capacity he demonstrated his ability as an executive. In this latter year he was raised to a full professor in the college.

Professor McColloch has published many bulletins, circulars, and scientific papers dealing with various phases of economic entomology in the cereal crops field and the relations of soils and insects. His work was always of a high caliber and his attitude was: "What is worth doing, is worth doing well." He had the ability to analize quickly a situation such as an insect outbreak. His life was one of service and help to others. He assumed other duties besides those of an entomologist, such as a worker in the Congregational Church, Masonic lodge, committee work of scientific societies, editorial work of the Kansas Agricultural Experiment Station, the Journal of the Kansas Entomological Society, and Biological Abstracts.

Professor McColloch was a member and worker in many scientific societies. The following are the societies: American Association for the Advancement of Science; American Association of Economic Entomological Society of America; American Microscopical Society; Kansas Entomological Society; Kansas Academy of Science; Sigma Xi; Phi Kappa Phi; Gamma Sigma Delta; Alpha Zeta; Rocky Mountain Conference of Entomologists, and the North Central States Conference of Entomologists.

An appropriate statement of the character and life of service of Prof. J. W. McColloch was expressed by the Rev. J. P. Jockinsen: "Staunch in character; upright in action; a true scientist; foremost among economic entomologists; yet a friendly spirit; warm in his fellowships; forgetful of himself; ever thoughtful of others; faithful to his church; a lover of his home; a follower of the Master; May the peace of God that passeth understanding abide with his spirit."

R. L. PARKER.

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NOTE

After January 1, 1930, Volume I, will be sold to those who wish it at $2.00 per volume. There are only a few complete sets of this volume in the hands of the Society.

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